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ABSTRACT

The paper reviews literature on the relationship between food, nutrition, and learning with particular emphasis on impairments in cognitive development and learning which result from malnutrition. Considered are means of detecting malnutrition, allergy symptoms, and steps a teacher can take in educating students and families about nutrition. Among measures recommended are replacing junk foods in vending machines with more nutritious snacks, upgrading the quality of school food programs, teaching children to evaluate advertising, and becoming knowledgeable on nutrition and its effects on learning. (SBH)

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NUTRITION AND LEARNING

PAPER PRESENTED

AT

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CONFERENCE

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NUTRITION AND LEARNING

"Nutrition is like a chain in which all of the essential items are the separate links. If the chain is weak or is broken at any point the whole chain fails. If there are 40 items that are essential in the diet, and one of these is missing, nutrition fails just as truly as it would if half the links were missing." (Williams, 1962, p. 23).

With the recent advances in scientific technology, the relationship between nutrition and learning is becoming more clear. The ramifications of the explosion of knowledge in the area of nutrition is now being felt by reading specialists, reading teachers, and classroom teachers who are directly involved with children who do not learn. The more knowledge we have about the effects of nutrition, the better we will be able to help children. Unless we understand the effects of nutrition, particularly poor nutrition, we will be unable to guide children and families to the appropriate professionals who can give medical and health advice.

Knowledge of the nutritional value of foods and their effects on individuals, especially the unborn child, is a twentieth century achievement. Throughout history, the hunger drive in humans has stirred their inquiring minds to search for answers about the relationship of food to health. Thus the field of nutrition began in response to this need to know (Lowenberg, et al., 1974). Today we look to trained biochemists who have a particular interest in nutrition to give us firsthand information on the subject of nutrition. In addition, we look to research in allied fields which examines the relationship between food, nutrition, and learning. That research is compiling at an extremely fast rate. What does it mean? How does it effect those of us in classrooms and clinics? What can we do to insure adequate nutrition for children in our schools?

Nutrition and Cognitive Development

The evidence is fast accumulating to support the view that malnutrition interferes with the development of the central nervous system and has effects on performance which include:

a. losing learning time

b. impairing learning during critical periods of development

c. changing the individual's motivation and personality. (Raman, 1969)

Shneour (1975) points out that one of the most profound effects that nutrition appears to have is in the shaping of cognitive potential and his evidence alerts us to the need for good nutrition during the critical periods of brain growth. The average adult brain weighs approximately 1400 grams (3 pounds) and its growth is a remarkable phenomenon. The greatest amount of growth takes place during the prenatal period and immediately following birth. [1]

The development of the brain is a precisely programmed evolution. Each specific part of the brain seems scheduled to be completed at a given time and place, and in its proper position in the sequence. Thus it is essential that the raw materials, nutrients, must be available during the growth of the organ. Any misfunction, especially one caused by malnutrition, could result in a defective structure and the consequences are irreversible and lifelong.

During the rapid prenatal growth of the brain, the development of the neurons takes place. In the human brain there are about eleven billion neurons whose functioning is basic to the acquisition, transfer, processing, analysis, and utilization of information; in other words, crucial to learning. Neurons can never be replaced or duplicated and Noback (1967) reiterates that humans

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[1] A special thanks to Margaret Ames, Solon Public Schools, for her review of the literature of the Effects of Nutrition During the Prenatal Period.

are born with their full compliment. Thus malnutrition during the pre and post-natal periods can severely limit the number of neurons produced and seriously effect a person's capacity to learn.

The brain is never at rest and constantly requires the same level of oxygen and nutrients. It uses about 500 calories of a 2,500 calorie diet. Any deprivation of nutrients, particularly proteins, can result in a reduced number of brain cells of the offspring (Zamenhof, et al, 1968). Dobbing, Hopewell, and Lynch, (1971) have shown that mild undernutrition during the prenatal period of rapid brain growth of the cerebellum resulted in a reduction of brain cells.

Other researchers have shown that there is a relationship between low birth weight and mental retardation (Capper, 1928). Bandera and Churchhill (1965) found that retarded children have a low birth weight even though the majority of retarded children in their study were full term babies, not premature. Churchill (1965) in a study of twins, found that the twin that had a lower birth weight, also, had a lower intelligence quotient. This research seems to indicate that restrictive diets during pregnancy may have serious effects on the growth and development of the fetus and subsequently on the ability of the child to learn. Fortunately, attempts are being made to insure that pregnant teenagers and women without the financial means to feed themselves adequately can get nutritional supplements and protein during their pregnancy and post-natally for their newborn children. (WIC, 1975).

Learning is closely related to the ability of the learner to establish adequate interpersonal relationships. Perkins (1975) notes that poor nutrition can effect interpersonal relations. Malnourished children appear more apathetic and irritable. Because of their apathy, adults become less responsive and thus the child does not receive as much attention from adults .

Chavez (1974) found that pregnant women who received dietary supplements had babies who grew faster and developed more quickly than the control group who received no supplements. The supplemented women's children slept less, spent more time out of their beds, talked and walked at a younger age, and were more vigorous in play. Because they were precocious, healthy, and lively, they became more interesting to their parents and more highly regarded by them. This in turn helped to continue the cycle of learning.

Nutrition and Learning

It now appears that even if the central nervous system has developed normally during the prenatal and postnatal stages, nutritional deficiences in subsequent years can severely impair the bases for learning and behavior in the child.

Read (1969) documents several studies that were conducted among malnourished poor throughout the United States. The results indicate a relationship between food intake and learning ability. Some learning capabilities were restored after nutritious diets were given to the undernourished but in cases where the malnutrition had been severe or existed for a long time, children did not catch up to the norms for their age groups.

Malnutrition is defined by the medical profession as "any disorder of nutrition; it may be due to unbalanced or insufficient diet or the defective assimilation or utilization of foods" (Dorland's, 1974). The serious forms of malnutrition are recognizable through routine medical diagnosis but the stages of malnutrition between normal growth and gross malnutrition have not been clearly defined.

Dr. Roger J. Williams has said that "medical students are taught very little about nutrition and clinical nutrition is not even taught in most medical schools, and not really adequately done in any of them. As a result, doctors are pitifully

weak on the subject and consequently slight nutrition in the care of their patients." (Graber, 1974, p. 12).

Von Hilsheimer (1967) noted that despite the medical model of most agencies that referred children to his Green Valley School, fundamental medical examinations had not been made of most children. He found that of the 183 children referred for behavior or learning disorders, 87% suffered from easily diagnosed nutritional deficiencies.

The most disturbed and most resistant children had the most severe and multi-dimensional deficiencies. Thiamine and other B-complex protein deficiencies were also extremely common. Moreover, every child referred with suggestions of schizophrenia or autism in the diagnosis from other agencies, was found to be sucrose (sugar) addicted. Nearly 100 percent of the most disturbed indicated high carbohydrate and sugar preferences in foods.

He states that "learning disabilities, behavior disorders, and emotional disturbances are not isolated entities but exist in a complex matrix with metabolic efficiency of the body and the occurance of systemic disease. Children with learning problems have a significantly higher number of distinctive physical anomalies. (1974, p. 16) He found that of the children seen at his school:

99% were undetected allergic children

90% needed high dosages of vitamin C

90% were deficient in manganese--(aids in body balance)

99% were deficient in potassium and sodium--causing increased nervous irritability and metal disorientation

90% were deficient in iron and zinc

99% had toxically high levels of copper and lead

86% were irregular in glucose and insulin metabolism

25% had high serum fats in their blood

In addition, others had deficiencies of malabsorption of food.

A large majority were physically immature but their growth increased when milk, wheat, corn, sugar, and chocolate were removed from diets.

Von Hilsheimer also found a number of allergic children, some autistic, who needed extremely high doses of vitamin B6. This indicated a dependency rather than a deficiency. In other words, the allergic and autistic child just may need more B6 than the normal child. Finally, 10% of the children referred to him, were overweight due to poor nutrition.

His research led him to conclude that allergic and metabolic problems are major factors in the disturbance of learning skills in children. He found that often the child had been labeled as schizophrenic, autistic, psychopathic, head-strong, difficult to discipline, stubborn, or as having no problem. Parents had been told: "that boys are slower than girls, your son will outgrow it, you are overanxious, or you must have the whole family in for psychotherapy despite the fact that other children in the family were quite competent, well behaved, and had no learning problems" (Von Hilsheimer, 1967, 1974).

Detecting Malnutrition

Diagnosis of children whether in a school or clinical setting clearly must determine if there is any underlying physical cause for the learning problem. Usually, the most that is done is to check auditory and visual acuity, but in many schools not even this is done before assignment and labeling of children. While reading teachers and classroom reachers should not overstep their professional competency, they certainly should be knowledgeable about symptoms that indicate nutritionally related problems and should know to whom to refer the child and what tests to request.

Nutrition and Allergy

What are some symptoms of allergies that the teacher may note? They are numerous but the common ones are frequent respiratory infections, constant congestion, the allergic salute (rubbing of nose), dark circles under the eyes, and a history of bedwetting. Other signs of allergy include wide mood swings, tearfulness, and disorientation often mistaken for drug abuse.

There should be a diet monitoring to determine if the child is actually ingesting foods that provide adequate nutrition. It is not enough to ask the parents what is served for meals. Rather, we need to know what the child actually eats and how it is prepared. The ideal diet should contain foods from four basic food groups, milk products, beans, grains and nuts, vegetables and fruits, and proteins, fish, meat, and eggs; in as natural a state as possible. Children who eat sugar coated cereals, white bread with jelly or a donut for breakfast, a lunchmeat sandwich on white bread, a snack chip, and a sugared dessert for lunch, and who balk at meat and vegetables for dinner but are allowed cookies, chips, soda pop, and other non-nutritious snacks between meals can not be adequately nourished by anyone's standards. Furthermore, the teacher who gives out candy as a reward only contributes to the malnourishment of the child.

The New York Institute for Child Development (NYICD, 1979) tries to establish a healthy internal environment for each individual child they see. Because nutrition plays a major role in physical development, neurological function, and learning, careful attention is paid to each child's medical history, laboratory analysis and family lifestyle. Parents must submit a seven day diet record prior to full diagnosis. It is analyzed by the nutritionist and pediatrician for nutrient intake and value, the amount and source of carbohydrates and the frequency of eating. Laboratory tests required include:

CBC; a blood count, SMA 12; chemical analysis of the blood, a complete thyroid profile, SGBT; a test of liver function, a urinalysis; a hair analysis; a blood lead level; and a five hour Glucose Tolerance Test.

The nutritional program is based on the laboratory findings, the reported medical and developmental history, the family medical history, the lifestyle, and the findings of the pediatrician's clinical examination.

The most common program will involve a diet eliminating sucrose, (white sugar) and imposing a limitation on the intake of natural sugars in fruits and polysaccaride foods, the removal of the BHT additive, artificial colors, artificial flavors, and foods containing natural salicylates. Six high protein feedings per day are recommended because they find a high number of abnormal glucose tolerance curves using the technical symptoms of hypoglycemia as described by the American Medical Association's criteria. Arrangements are made for periodic follow-up consultations during the time the child is attending the clinic and after six months the nutritional program is reassessed. Certainly, before we lable and place a child in any special classes, we should require as thorough a physical examination if the child has exhibited inability to profit from the usual classroom instruction and we know the intelligence is adequate.

What Can the Teacher Do?

As classroom teachers and special reading teachers, we are in the position to educate our pupils and their families about nutrition. The Nutrition Education Training programs that are in effect in every state are one source of information and help. These centers can guide us to printed material and other media materials to use with children and adults. One very interesting and thought provoking film is "Eat, Drink, and be Wary" produced by Churchill Films in Los Angeles, California. This movie shows the dangers of an unbalanced

diet because of our preference for convenience and manufactured foods which are often highly sugared and full of artificial colors and additives. It is an excellent film to show at the first PTA meeting in September and again at Open House.

Fiengold, (1974) believes the food eaten daily has been processed and refined, colored and flavored, frozen and thawed to meet the palate of the critical American shopper. Convenience is a prime consideration. There is ample evidence that the valuable nutrients have been lost during the processing, and the addition of chemical additives have caused a medical crisis. It is possible that millions of children are unable to assimilate their daily diet resulting in an insufficient, unbalanced diet.

We can become alert to the example we set as teachers and educators. Do we give "junk foods" as treats to our children? Do we tolerate our school system selling junk food in vending machines accessible to any child with the money? Is the six to seven thousand dollars a year that a school can make from about 15 vending machines worth destroying our students' health. Vendors can put good foods into the machines such as unsalted nuts, whole grain snacks, fruit, hard boiled eggs, yogurt, milk, and unsweetened fruit juices.

The National School Food Action Committee, a coalition of consumer activist nutrition groups petitioned the United States Department of Agriculture on Food Day, April 21, 1977 to upgrade the quality of school food programs. They asked for a limit on the amount of fat, cholesterol, sugar, and salt in school meals and for an increase in the use of natural foods such as fresh fruits and vegetables. They also asked for a ban on the use of harmful artificial colorings and preservatives and a reissue of the ban, killed in 1973, on the serving of non-nutritious foods in school lunch and breakfast programs. Of particular concern was the sugar coated cereals and the items availabe only

in the schools such as Krumb Superkake, Huz-zah, Tastybreaks, Super-rich Donut, Super Donut, and Astrofood.

Dr. Michael Jacobson, co-director of the committee, pointed out that these vitamin enriched junk foods are disastrous to nutrition education. The message is that "junk foods are good for you."

McCormack (1977) noted that the committee's petition was just part of a nationwide move to include more wholesome foods in the school cafeterias. She found that Los Angeles secondary schools told each school to study the problem of the sale of snack foods and drinks on school premises in response to demands of nutrition activist groups who asked that candy, soft drinks, and other junk foods be banned.

The California state board of education was asked by nutrition groups to ban offers to trade cereal box tops and drink mix labels for sports equipment or cash for school projects. The District of Columbia school board banned the purchase of any foodstuffs on which the manufacturer does not publicly disclose the percentage of sugar and called for minimizing the use of pre-sweetened cereals and pre-sweetened foods served in the schools. In Ohio, the State board of education urged Ohio schools to serve more nutritious foods and beverages and to give effective instruction in nutrition.

We can work also on improving the menu in the school cafeteria. Farmilant, (1975) describes how she helped to gradually introduce natural and more nutritious foods into two schools in Chicago. The menu included all the children's favorite foods but they were made with whole grains, fresh produce, and meat without sodium nitrate and preservatives. They fortified foods with sea kelp, sunflower or sesame seeds, soy flour, or miso. Desserts were either fresh fruits of baked goods they made themselves from whole grain flours and honey or fruit sugar. They found sources for their needs and were able to buy in

bulk to keep the cost the same as before.

She wrote that it took about six weeks for the children to learn to really enjoy the food but by gradually changing things, it worked. For example, they began to make sandwiches with one slice of white bread and one slice of whole grain bread and finally all whole grain breads. They learned that if the food appealed to the eye, the children would eat it. It also helped to have the teachers eat with the children.

The teachers themselves had complained about the old menu being too full of starchy, refined foods, with desserts high in refined sugars and low in nutrition. The students were informed of the changes in the program through a humorous assembly. She noted that the battle between the natural foods students and the hardline junk food students was carried out in the school newspaper and in conversations. They only complaint was from one mother who complained that the whole grain bread required her child to chew too much!

We teach our children to evaluate advertising, particularly television advertising. One government report found that the moderate TV-watching child in 1975 saw between 8,500 and 13,000 food and beverage commercials. Almost 70% of the commercials were devoted to products high in fat, saturated fat, cholesterol, sugar, or salt. Recent research has shown that television advertising implants food consumption values in children and ultimately affects the choices their parents make, as well. (Edible TV, 1978).

Lastly, we can educate ourselves in the area of nutrition and its effects on learning so we can recognize the difference between poorly substantiated theories and those which have been well researched. There is a wealth of information available on nutrition but we must beware of that which is slanted. Even some materials designed for use in nutrition education programs, often given free by commercial food processors, carry subtle messages that non-nutritious

foods are nutritious. For example: pamphlets and posters which include cake and cookies in the bread and cereal group or ice cream in the dairy products group.

It is evident that there are many powerful influences in children's lives that educators must overcome if we are to have both healthy and educated citizens. It is imperative, however, in the light of the research on the influence of diet on the learning capabilities of children, on their ability to attend and concentrate, and on their ability to manifest appropriate social behavior, that we begin nutrition education early in the school years and continually emphasize it through high school. Since children do not control the menu at home, we should aim our program at the family as a whole. Research indicates that it takes more than one generation to reverse the effects of poor nutrition but that changing the child's diet can have some immediate effects on attention, learning capacity and interpersonal relations.

Books for the teacher to start with are :

Cheraskin, E. & Ringsdorf, W., & Clark, J., Diet and Disease Emmaus, Pa.: Rodale Books, 1968.

Ewald, E. Recipes for a Small Planet, New York: Ballantine Books, 1973.

Hunter, B., Natural Foods Cookbook, New York: Simon & Schuster, 1961.

Jacobson, M. & Lerza, C., Food for People, Not for Profit, New York: Ballantine, 1975.

Lappe, F. M. Diet for a Small Planet. New York: Ballantine Books, 1971.

Lindlahr, V., You Are What You Eat. New York: Lancer Books, 1973.

Lowenberg, M. E. et al., Food and Man. New York: John Wiley & Sons, 1968.

Mayer, J., A Diet for Living, Pocket Books, New York, 1977.

Passwater, R., Supernutrition. New York: Dial Press, 1975.

Schneour, E. A. The Malnourished Mind, New York: Anchor Press, 1975.

Watson, G. Nutrition and your Mind; New York: Harper and Row, 1972.

Williams, R. Nutrition Against Disease. New York: Bantam Books, 1973.

Williams, R. Nutrition in a Nutshell, New York: Dolphin of Doubleday & Co. Inc., 1962.

Summary

Nutrition has a profound effect on cognitive potential and on behavior. The effects of poor or malnutrition may not be noticed by the classroom teacher or the reading specialist who is not aware of the effects of nutrition. It is necessary to look at the causes of reading and learning problems and one of them may be an inadequate diet. Nutrition education for teachers, school children, and their families will be the only way to counteract the pervasively strong influence of advertising of non-nutritious foods.

References

Bandera, E. & Churchill, J. "Prematurity and Neurological Disorders". Henry Ford Hospital Bulletin. 1961,(9), pp. 414.

Capper, A. "The Fate and Development of the Immature and the Premature child". American Journal of Diseases of Children, 1928. Vol 35, p. 262.

Chavez, cited in Tizard, J. "Can the Brain Catch Up?" World, 1974, Vol. 10, pp. 10-14

Dobbing, J., Hopewell, J. W., & Lynch, A. "Vulnerability of the Developing Brain: VII Permanent Defecit of Neurons in Cerebral Cortex Following Early Milk Undernutrition", Experimental Neurology, 1971, Vol 32, pp. 439-447.

Churchill, J. A. "The Relationship Between Intelligence and Birth Weight in Twins". Neurology, 1965, vol 15, pp. 341-347.

Dorland's Illustrated Medical Dictionary, 25th Edition, New York: W. B. Saunders Company, 1974.

Farmilant, Eunice. "Natural Foods Can Be Served in Schools". Prevention, 1975, pp. 82-87.

Feingold, B. F. Why Your Child is Hyperactive. New York: Random House, 1974.

Graber, D. "Megavitamins, Molecules and Minds". Human Behavior, 1973, (May), pp. 8-15.

Lowenberg, M. E., Todhunter, E.N., Wilson, E. D., Savage, J. R., & Lubawski, J. L. Food and Man. New York: John Wiley & Sons, 1974.

McCormack, P. "More Fruit, Less Sugar: Changes in School Food Programs Urged by Nutrition Groups". The Cleveland Press, 1977, (April 11), Home Section.

Noback, C. R. The Human Nervous System. New York: McGraw Hill Book Co., 1967.

New York Institute for Child Development, Inc., The Nutrition Program, 042579-300, 1979.

Perkins, H. V. Human Development. Belmont, California: Wadsworth Publishing Company, Inc., 1975

Raman, S. P. "Role of Nutrition in the Actualization of the Potentialities of the Child: An Anisa Perspective". Young Children. 1975, (November), pp. 24-31.

Read, M . S. "Malnutrition and Learning". American Education, 1969 vol. 5, pp. 11-14.

Shneour, E. A. The Malnourished Mind. New York: Anchor Books, 1975.

U. S. Department of Health, Education, and Welfare. WIC Program Survey, Washington, D. C.: Author, 1975.

U. S. Department of Health, Education, and Welfare. Edible TV: Your Child and Food Commercials. Washington, D. C.: Author, 1977.

Von Hilsheimer, George. Allergy, Toxins, and the Learning-Disabled Child, San Rafael, California: Academic Therapy Publications, 1974.

_____, Is There a Science of Behavior: Humanitas Curriculum, Orange City, Florida, 1967.

Williams, R. Nutrition Against Disease. New York: Bantam Books, 1973.

_____, Nutrition in a Nutshell. New York: Dolphin Books, Doubleday & Co., Inc. 1962.

Zamenhof, S., Van Marthens, E., & Margolis, F. L. "DNA (Cell Number) and Protien in Neonatal Brain: Alteration by Maternal (F_0) Dietary Protien Restriction". Science, 1968, vol. 160, pp. 322-323.